299-E33-17 (A4843)

Log Data Report

Borehole Information:

Borehole: 299-E33-17 (A4843)			Site: 216-B-8 Crib		
Coordinates (WA State Plane)		GWL[1] (ft):	233.42	GWL Date:	12/01
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
137467.183 m	573878.517 m	09/53	635.05 ft	244.0	Cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	1.82	8.625	7.981	0.322	0	242.5

Borehole Notes:

The casing depth information, drill date, total depth, and type of drilling equipment provided above are derived from a well construction and completion summary obtained from *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells* (Ledgerwood 1993). The nominal casing size information for the 8-in. steel casing and stickup is confirmed from tape and caliper measurements collected in the field by MACTEC-ERS personnel and represents dimensions of ASTM schedule-40 steel pipe. The groundwater level was measured from the TOC by the Duratek Federal Services well service crew during extraction of a pump prior to logging. Coordinates and the TOC elevation are derived from HWIS[3]. The TOC elevation is reported as 631.65 ft in the well completion summary and 635.05 ft in HWIS. The reason for this discrepancy is unknown.

The well completion summary reports an 8-in. casing had been placed to 242.5 ft; the borehole was drilled to 244 ft where basalt was encountered. Perforations were made in the 8-in. casing from 220 to 242.5 ft.

Logging Equipment Information:

Logging System:	Gamma 1D		Type:	SGLS (35%)
Calibration Date:	07/01	Calibration Reference:	GJO-2001-243-TAR	
		Logging Procedure:	MAC-HGLP 1.6.5	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5
Date	01/11/02	01/14/02	01/15/02	01/16/02	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	2.0	49.0	140.5	243.0	
Finish Depth (ft)	50.0	141.5	234.0	210.0	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	n/a[4]	n/a	n/a	n/a	
Pre-Verification	A0073CAB	A0074CAB	A0075CAB	A0076CAB	

Log Run	1	2	3	4	5
Start File	A0073000	A0074000	A0075000	A0076000	
Finish File	A0073096	A0074185	A0075187	A0076066	
Post-Verification	A0073CAA	A0074CAA	A0075CAA	A0076CAA	

Logging Operation Notes:

Spectral gamma logging was performed in this borehole during January 2002 on four separate days. The sonde was placed inside a plastic bag during logging to prevent the possibility of cross contamination from the groundwater. A repeat section was collected in this borehole during log run 4 from 210 to 234 ft in depth.

Logging measurements are referenced to the top of the 8-in. casing.

Analysis Notes:

Analyst:	Henwood	Date:	01/17/02	Reference:	MAC-VZCP 1.7.9, Rev. 2

Pre-run and post-run verification measurements were performed for each day's log event. The efficiency (peak counts per second) of the logging system was consistently lower each day in the post-run verification as compared to the pre-run verification. This change is generally in the range of 6 to 13 percent. The cause of this discrepancy is being investigated. Evaluation of the spectra indicates the detector is functioning normally and the log data are provisionally accepted, subject to further review and analysis. The post-run verifications were used for the energy and resolution calibration necessary to process the data.

A casing correction for a 0.322-in.-thick casing was applied. A water correction was applied to data below 233.4 ft in depth.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G1dcalc4.xls using an efficiency function and corrections for casing and water as appropriate. No dead time corrections were necessary as the dead time did not exceed 10 percent. The ^{214}Bi peak at 609 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 1764 keV. The 609-keV energy peak generally exhibited slightly better count rates and less error than the 1764-keV peak.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclides (^{137}Cs and ^{60}Co) detected in the borehole, naturally occurring radionuclides (^{40}K, ^{238}U, ^{232}Th [KUT]), a combination of man-made, KUT, total gamma, and dead time, a repeat section, and a comparison plot of man-made radionuclides from data collected in 1997 by Waste Management Federal Services (WMFS) NW and the current SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections.

Results and Interpretations:

^{137}Cs and ^{60}Co were the man-made radionuclides detected in this borehole. ^{137}Cs was detected near the ground surface and between about 119 and 228 ft at a maximum concentration of about 2 pCi/g. ^{60}Co contamination was detected between 226 ft and the total logging depth at 243 ft. The maximum ^{60}Co concentration was about 11 pCi/g at the bottom of the logged interval (243 ft). The depths of

contamination appear to coincide with historical groundwater levels. It is possible historical groundwater levels rose to about the 220-ft level, leaving residual contamination in the sediments as the groundwater receded to the current levels at about 232 ft. This borehole is well outside the boundaries of any defined waste site. There is very little contamination detected in this borehole until the depth of groundwater is approached, suggesting the contamination originated from a distant source.

The KUT log profiles are essentially featureless, indicating only subtle variations in the sediments. On the basis of the ^{40}K concentrations, a transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2 occurs at about 18 ft in depth.

A repeat logging section shows generally good agreement in radionuclide concentrations and depth, suggesting the system was operating properly. The repeat total gamma count rates are systematically higher than those collected for the original log in the depth interval from 210 to 235 ft. The repeat section was collected at the beginning of a day's logging (log run 4) and the main log (log run 3) at the end of a day. This difference in count rates is consistent with the difference between pre- and post-verification data that suggests the efficiency of the logging system deteriorates during a day's logging. For this repeat section the average difference of the total gamma count rates was 4 percent. A similar variation is observed in the radionuclide concentrations, but this variation is within the counting error.

A comparison log plot of data collected in 1997 by the WMFS Radionuclide Logging System (RLS) and in 2001 with the SGLS is included. The RLS concentration data (^{137}Cs and ^{60}Co) were decayed to the date of the SGLS logging event in January 2001. The comparison shows good agreement The profile for both ^{137}Cs and ^{60}Co has remained the same shape between the logging events, suggesting that no significant change has occurred in the last 5 years.

References:

Ledgerwood, R. K. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Revision 0, Westinghouse Hanford Corporation, Richland, Washington.

[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable

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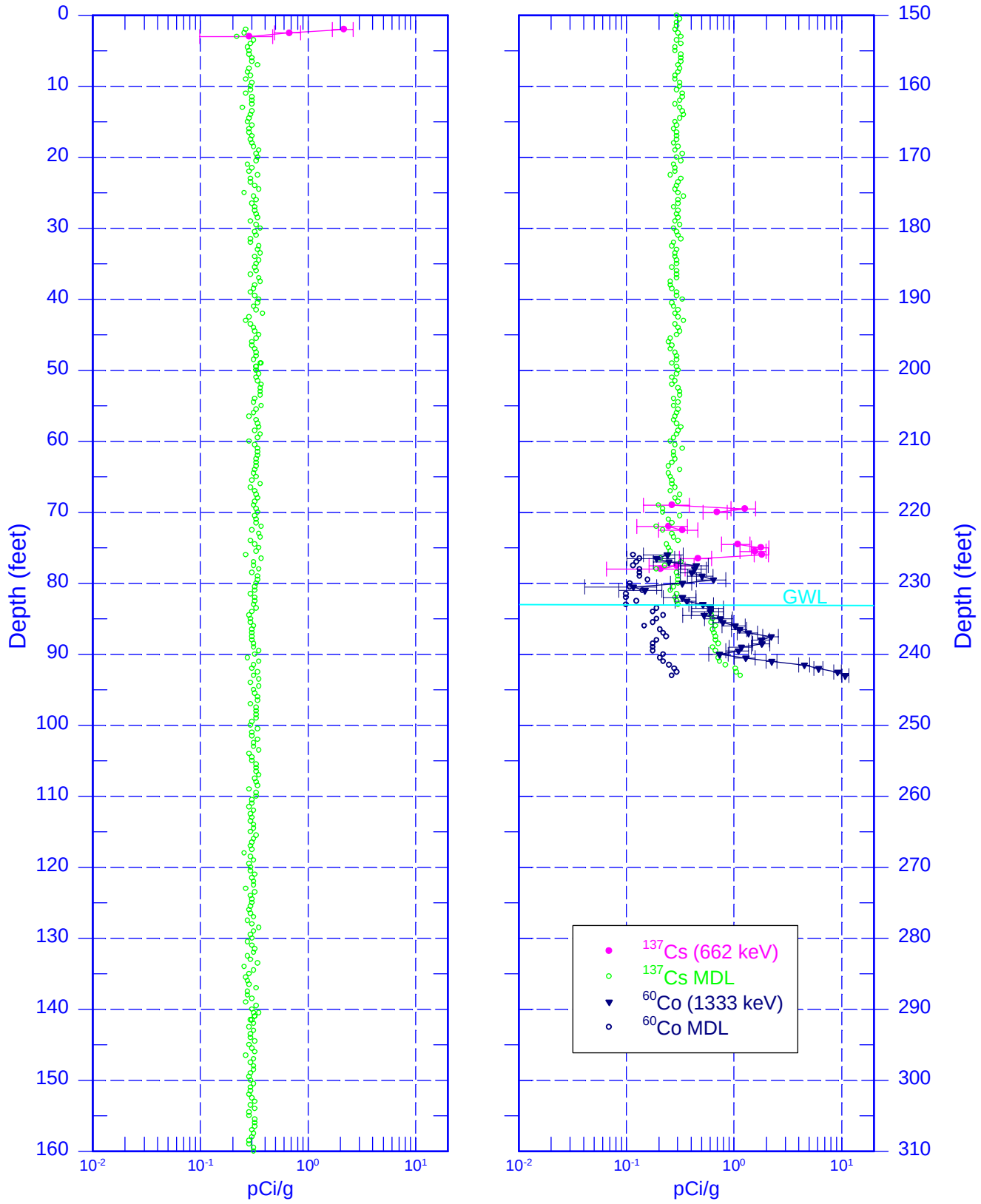
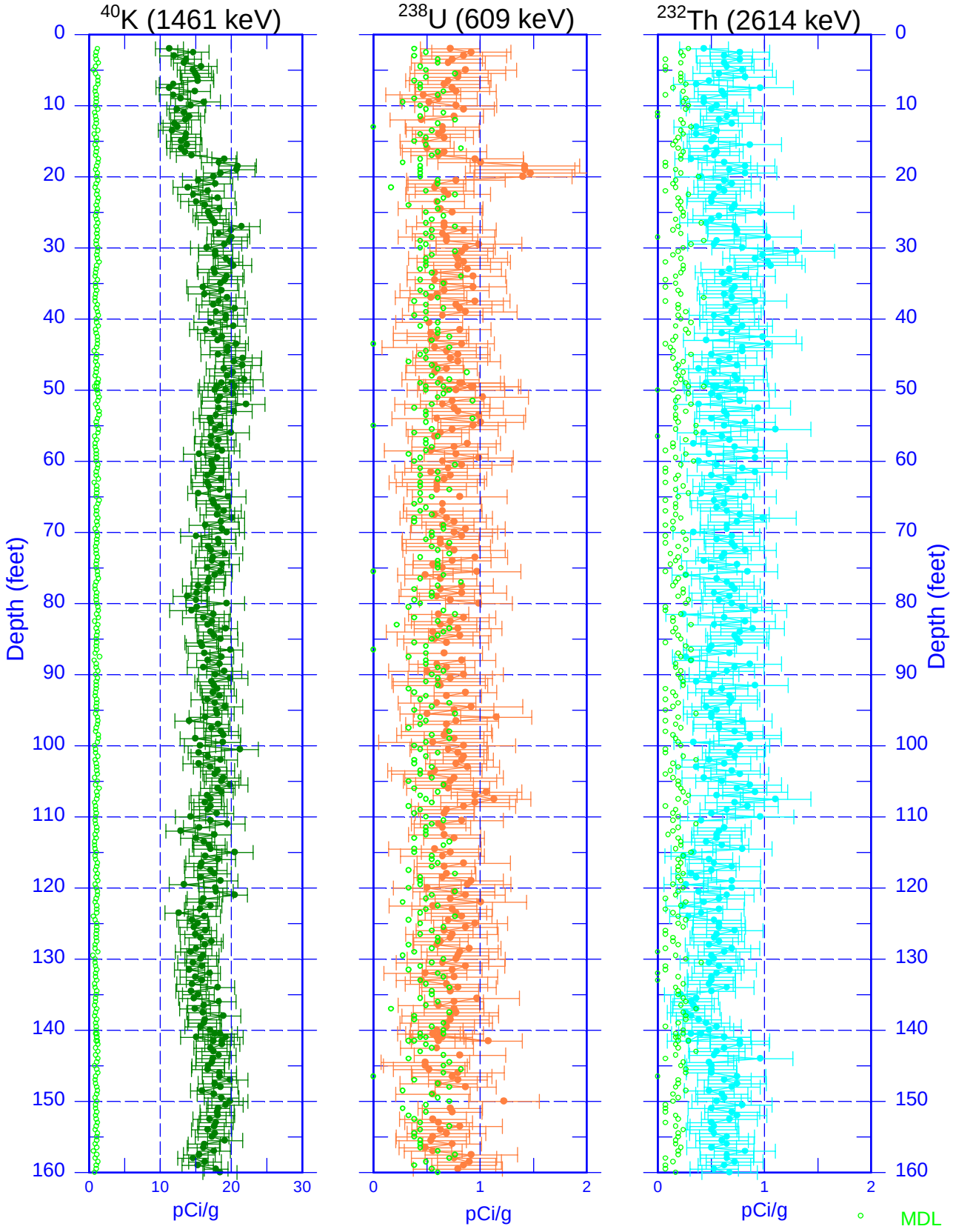
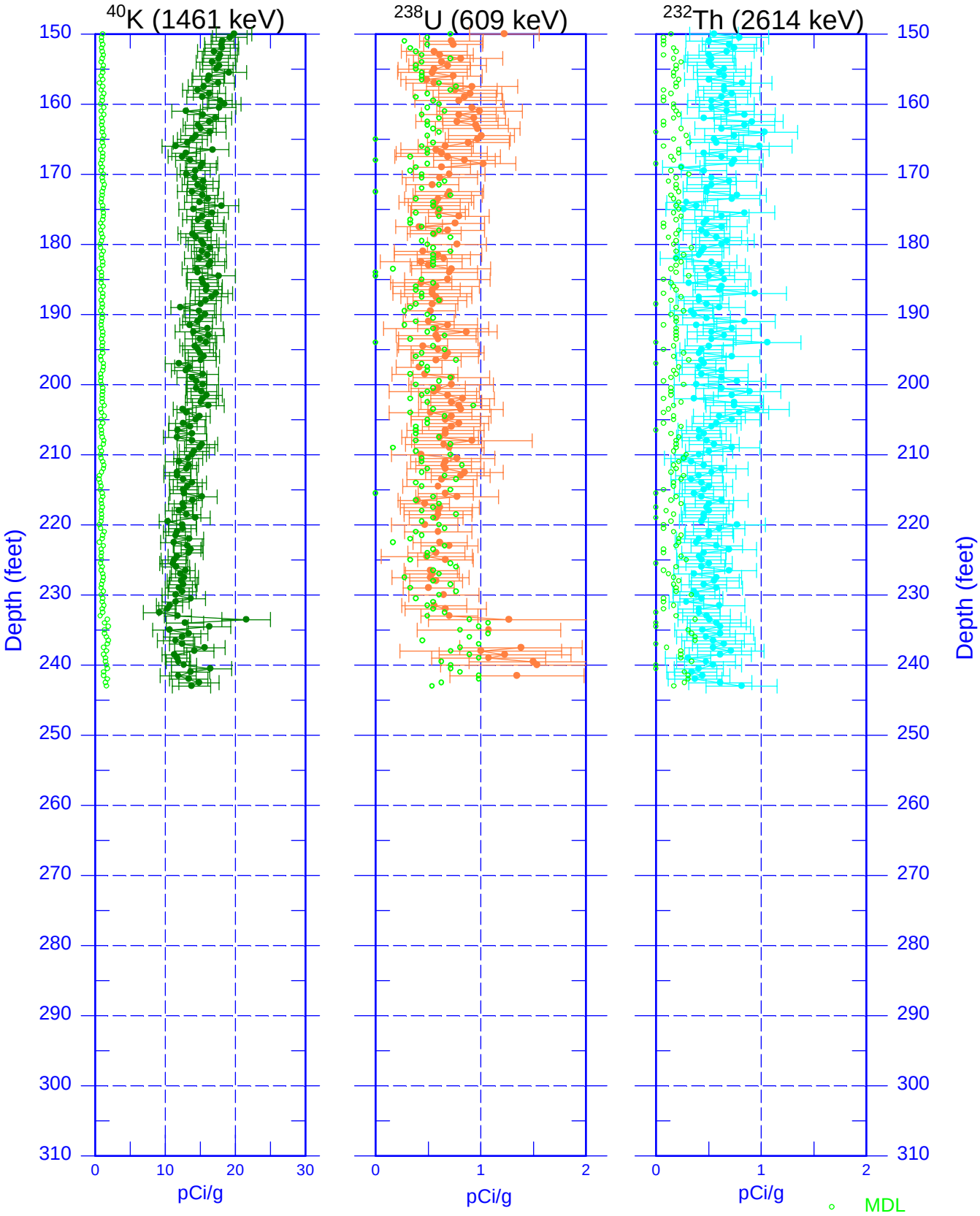
Man-Made Radionuclide Concentrations



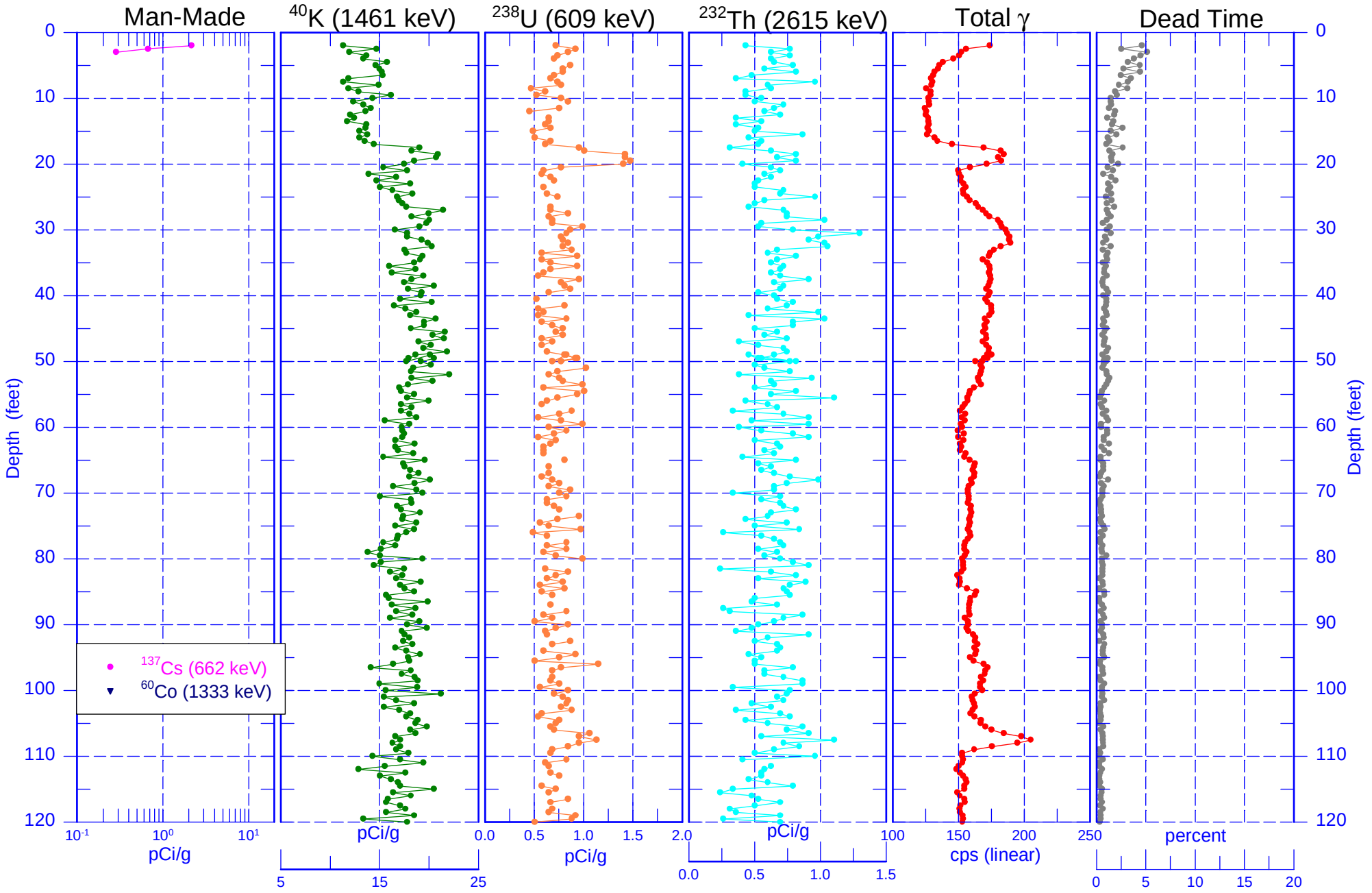
299-E33-17 (A4843)
Natural Gamma Logs



299-E33-17 (continued)
Natural Gamma Logs



299-E33-17 (A4843) Combination Plot



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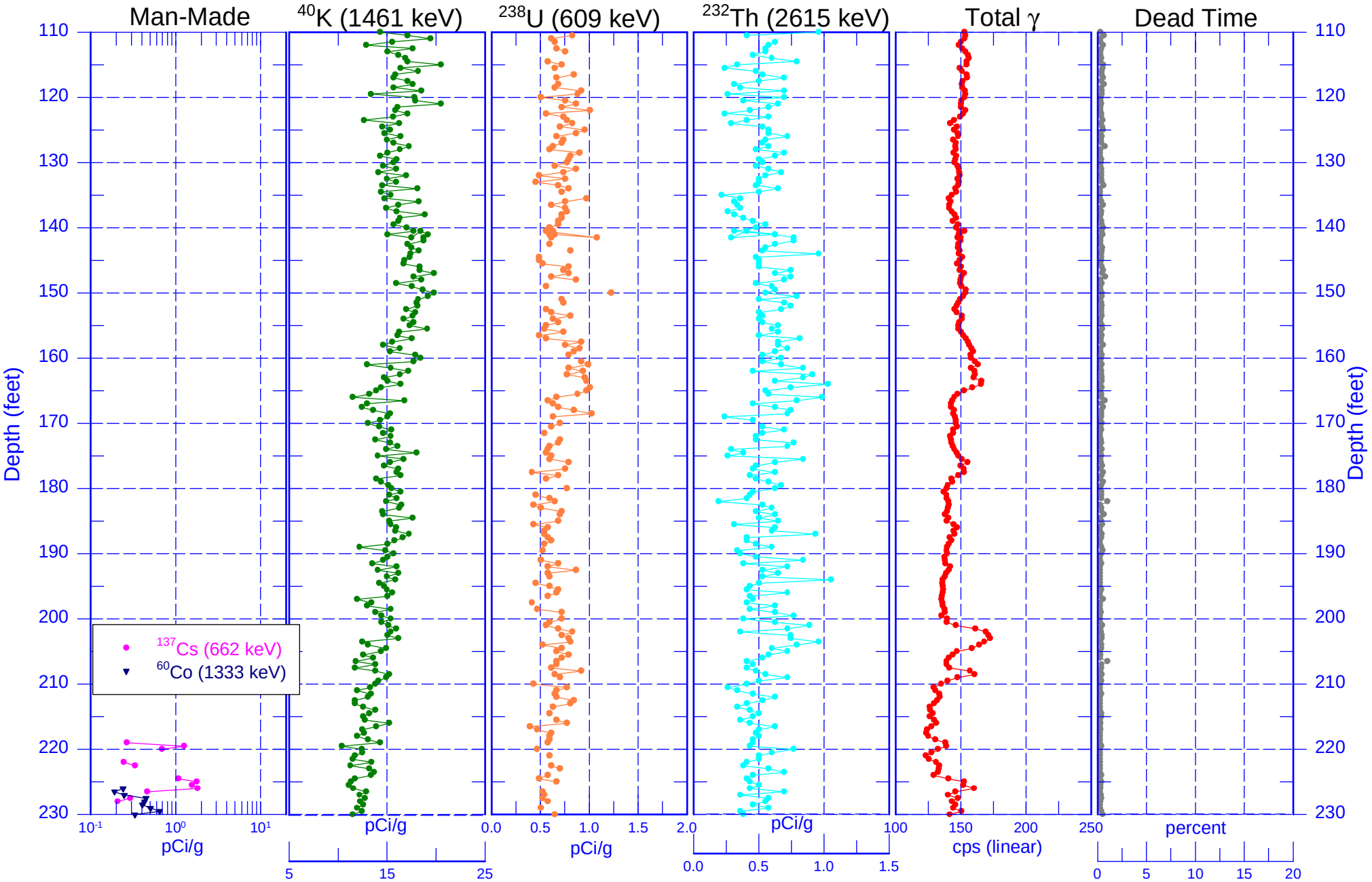

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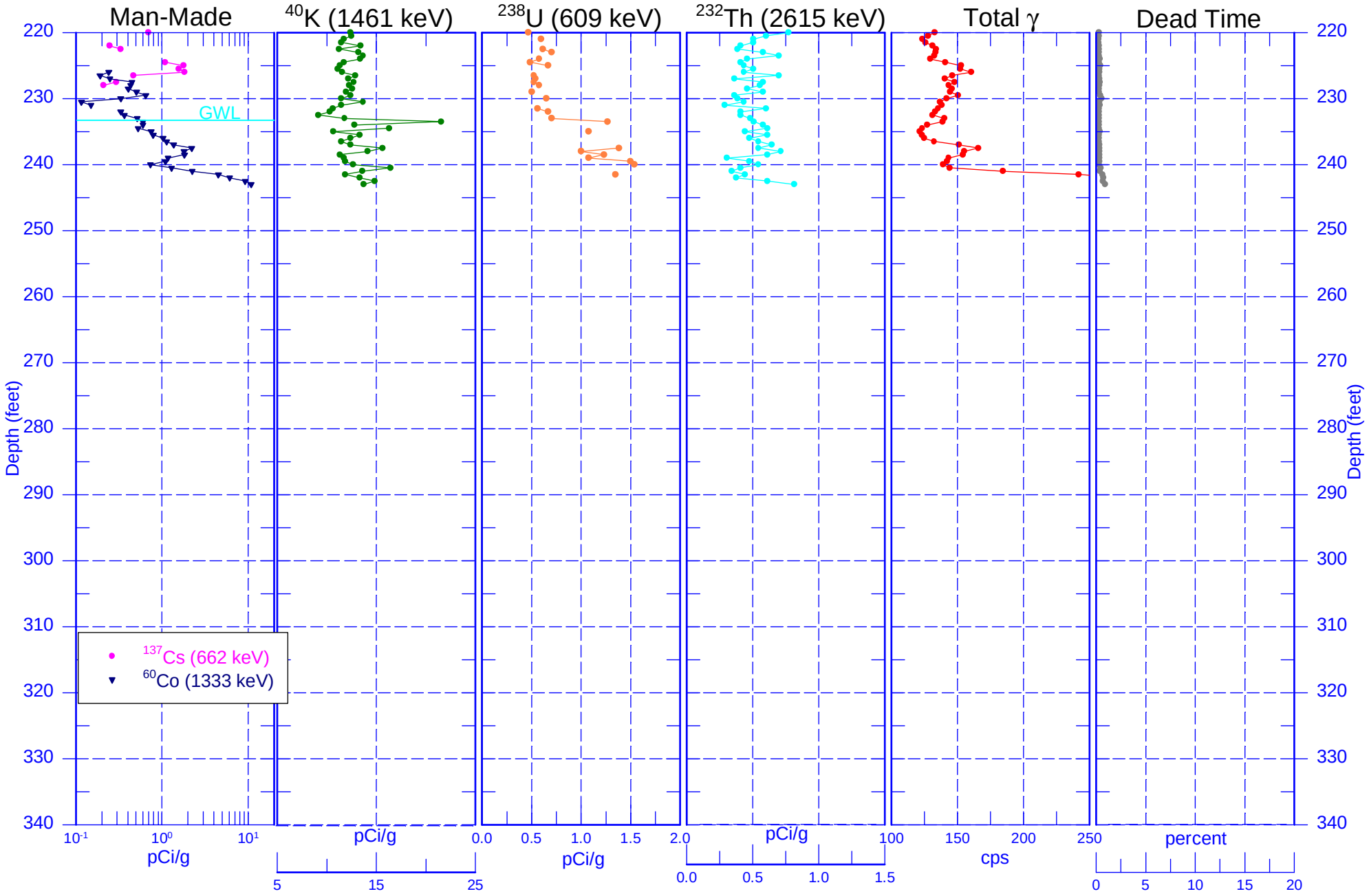
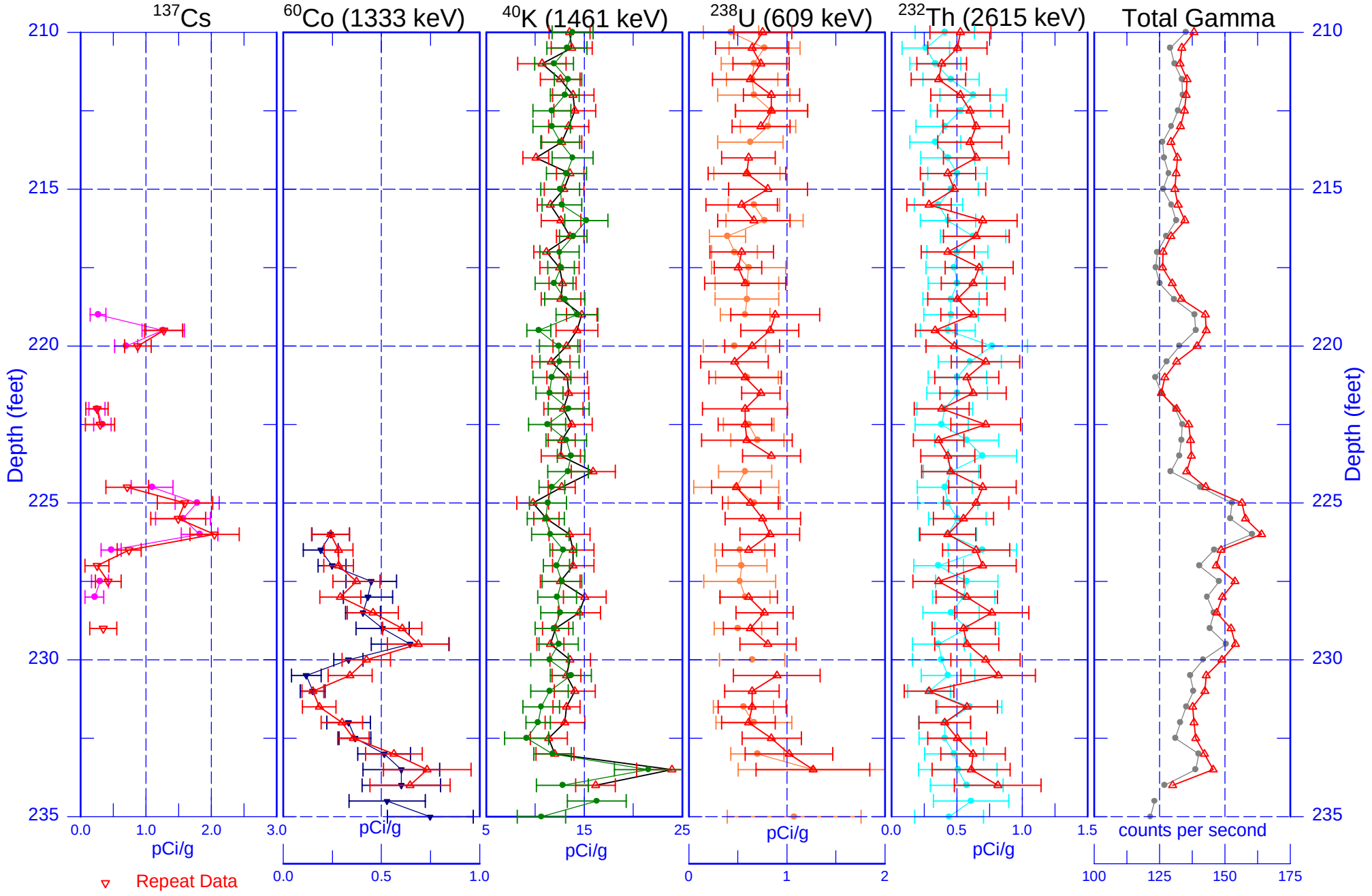


299-E33-17 (A4843) Repeat Section



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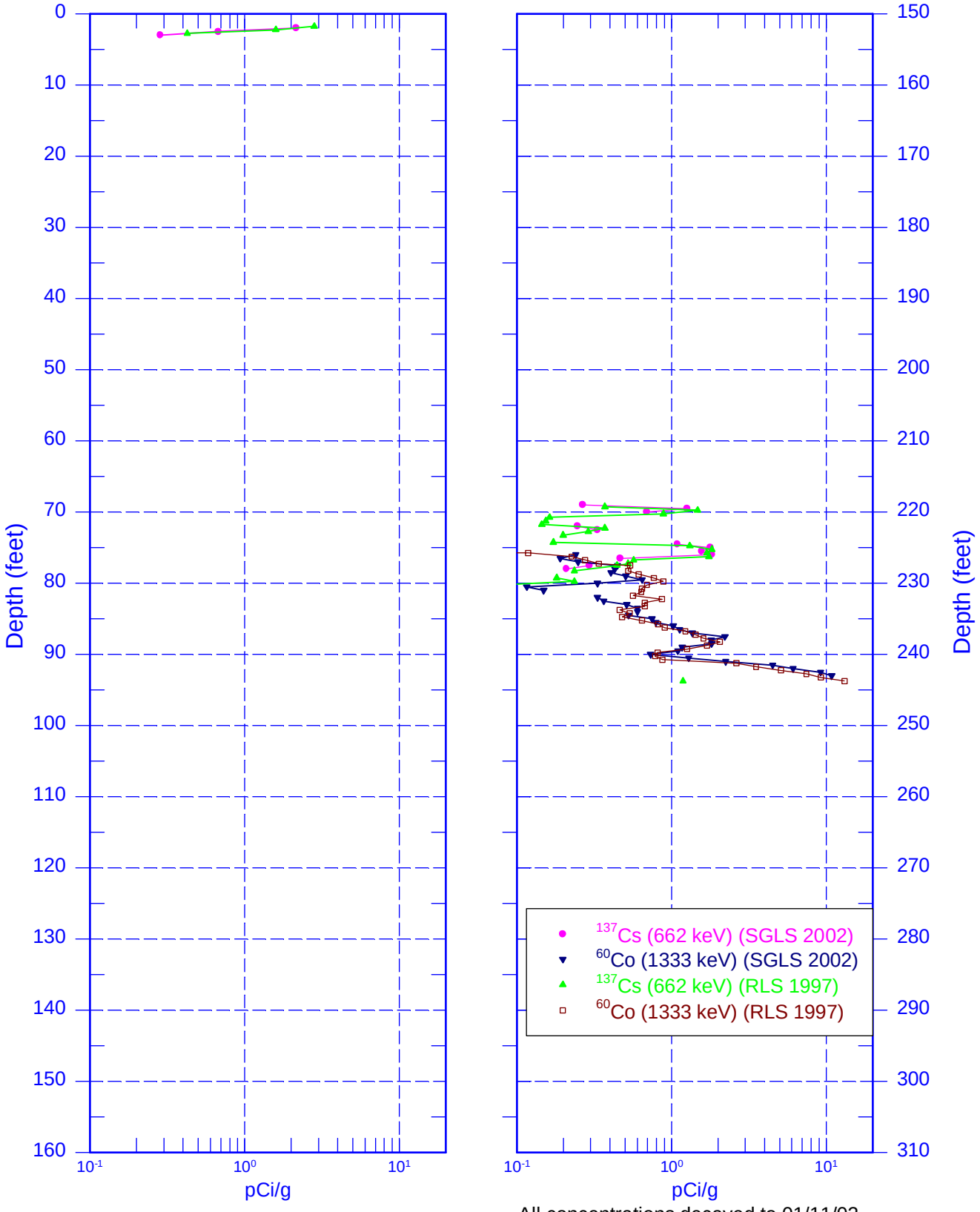
Comparison Plot of RLS and SGLS Data



All concentrations decayed to 01/11/02